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Modernizing Information Technology in the Office of Economic Adjustment

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Jeffrey S. Frost
Michael P. McEwen

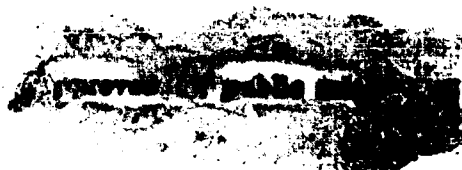
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Modernizing Information Technology in the Office of Economic Adjustment

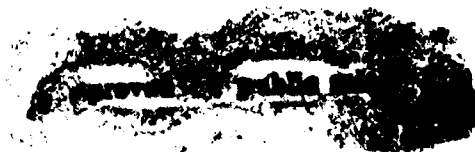
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Jeffrey S. Frost
Michael P. McEwen

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Logistics Management Institute
6400 Goldsboro Road
Bethesda, Maryland 20817-5886



Modernizing Information Technology in the Office of Economic Adjustment

Executive Summary

The Office of Economic Adjustment (OEA) helps local communities and DoD contractors cope with contract terminations, base closures, and other significant changes resulting from decreases in defense spending. Because of DoD-wide restructuring, OEA's workload has been steadily increasing during the past year. To meet the larger workload, the OEA will grow by about one-third to approximately 50 staff members by September 1993. If the OEA is to succeed, its information technology (IT) must enable those staff members to organize and manipulate a wide variety of data. Unfortunately, the current automated environment will not meet those requirements without making a substantial investment.

While serving staff members well in the past, the OEA's current information systems are now obsolete. The systems do not comply with recent office automation guidelines published by the OSD standards-based architecture working group and consist mainly of equipment from Wang Laboratories, which filed for bankruptcy in 1992. The OEA must decide how to modernize its IT to meet its requirements and overcome the shortfalls listed below:

- ◆ The Wang equipment is primarily a word processing system, forcing staff members to use personal computer (PC) software for other functions. The resulting hybrid Wang-PC environment is not easy to use. Applications are not integrated, lack a graphical user interface, and do not provide what-you-see-is-what-you-get (WYSIWYG) screen displays.
- ◆ The current automated environment is not responsive. For example, laser printers are slow and awkward to access and workstations do not support multitasking.
- ◆ OEA staff members cannot communicate electronically with people at the Pentagon or at the Sacramento office.
- ◆ Some users are not adequately trained to use the existing IT.

To support its staff through the end of the decade, the OEA should procure and maintain two local area networks (LANs) of PCs — one for its Sacramento office and one for its Washington office. The OEA should link these two locations with electronic mail and connect the Washington office to the OSD network backbone for Pentagon, Defense Data Network (DDN), and Internet access. On the desktop, we recommend IBM-compatible PCs, an operating environment that supports workgroup computing, and a suite of applications software that meets OEA's office automation requirements. When coupled with

appropriate migration strategies, these recommendations will enable the OEA to establish an IT environment that is easy to use, responsive, and cost-effective.

To successfully migrate from the current environment to the recommended environment, the OEA must modernize its IT infrastructure, ensure that the new infrastructure and staff members are adequately supported and improve its business practices to exploit the new infrastructure. The OEA must develop procurement and funding strategies to begin this migration process. Because the OEA now reports to the Assistant Secretary of Defense for Economic Security, we recommend that the Director assess the suitability of procurement vehicles already available to staff units within the Office of the Under Secretary of Defense for Acquisition and Technology. Our recommendations for resolving other implementation issues are as follows:

- ◆ Hire or appoint a full-time transition manager to supervise the system migration. Preferably, this transition manager would become an internal support contact as the migration proceeds.
- ◆ Hire or appoint one person for technical support and use outsourcing as needed for any additional personnel requirements.
- ◆ Select one organization to provide the hardware, software, and services that comprise the new IT environment. Those services should include both off-site group training and on-site individualized instruction.
- ◆ Install all of the new equipment at once and operate it in parallel with the Wang system for a 60-day cut-over period.
- ◆ Stay informed about OSD standardization and business process re-engineering initiatives and align OEA IT as needed.
- ◆ Include technology refreshment provisions in procurement and funding strategies to prevent IT obsolescence in the future.

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CHAPTER 1

Introduction

For a variety of reasons, the DoD Office of Economic Adjustment (OEA) is at a critical juncture in its history. The defense drawdown and recent military base closures are increasing OEA's workload. The OEA staff is growing by about one-third (i.e., an additional 15 people) to handle the increasing workload and to better serve its customers: the communities affected by the closures. The larger workloads and increased staff have strained OEA's current information processing systems, which are based primarily on out-dated technologies.

This report provides the strategic guidance that OEA needs to modernize its existing information technology (IT) and to better meet its responsibilities in the post-Cold War era.

PURPOSE AND SCOPE

This report examines OEA's current information processing requirements, identifies gaps ("shortfalls") between those requirements and its current IT capabilities, and recommends a solution to correct the shortfalls. After describing that target solution, we present a migration strategy that explains how OEA can move from its current environment to the target environment. To use this report, the Director of OEA should review our recommendations and translate them into a formal, written plan of action. We propose a format for that plan in Appendix B.

We view IT improvement as a continuous process. Our target solution will correct the shortfalls identified at the end of 1992. Without an ongoing program for technology refreshment, however, OEA may soon face serious deficiencies in its information processing capability once again. Therefore, OEA should not interpret our solution as the ultimate goal but as a first step toward building a flexible IT infrastructure that continues to meet the needs of its staff members as the nature of their work evolves and technology advances. Small improvements made frequently are more cost-effective than extensive changes made less often. The former approach promotes staff member participation in the management of the IT on which they rely.

We limited the focus of our analysis to the OEA offices in Washington, D.C., and in Sacramento, California. However, since OEA exchanges information with a variety of external organizations, we briefly examined these organizations as well. This report assumes that building electronic bridges to those entities would require OEA to do most of the work. Therefore, we direct our recommendations for improvements to the Director of OEA. In reviewing these recommendations, the Director should also consider the potential effects of other ongoing DoD initiatives related to IT.

RELATED EFFORTS

The OEA is not alone in its IT modernization efforts. This section relates the Defense Management Review (DMR), corporate information management (CIM), and standards-based architecture (SBA) initiatives to OEA's modernization plans.

Defense Management Review

In 1989, the Secretary of Defense presented the Defense Management Report to then-President Bush. That report recommended specific initiatives known as Defense Management Report Decisions (DMRDs) to save \$70 billion in defense costs over the next several years. One initiative, DMRD 918, establishes the Defense Information Systems Agency (DISA) as the central manager of DoD's information infrastructure. DMRD 918, if completed, will make DISA responsible for operational telecommunications (long-haul, regional, and base-level), information and computer security, data processing, and systems integration. In the short term, OEA might be eligible to receive technical support from DISA or use DISA contracts to acquire equipment and services. Over the long term, OEA should align its own IT infrastructure with whatever standards DISA establishes.

Corporate Information Management

Besides DMRD 918, the DMR also spawned the CIM initiative. The Secretary of Defense established this initiative to improve the effectiveness and efficiency of automated information systems by re-engineering underlying business processes; ensuring data consistency; and building a standard, robust, and nonredundant IT infrastructure. Business process re-engineering is the fundamental redesign of the procedures, organizational structures, and management principles needed to perform a business operation. Ensuring data consistency standardizes data elements throughout DoD and treats them as Department-wide assets. The third leg in the CIM triad, the IT infrastructure, will support both the re-engineered business processes and standard data elements with cost-effective computing and communications facilities.

Although this report focuses on infrastructure only, OEA should not make IT decisions in a vacuum. Only by considering process re-engineering and data standardization along with infrastructure modernization, can OEA reap the full benefits of CIM. The OEA should consult DoD Directive (DoDD) 8020.1 (i.e., *Functional Process Improvement*) and DoD Instruction 8020.1-M, the accompanying manual, for more information on this topic. Many other OSD organizations are actively implementing CIM, some by constructing standard office automation architectures.

Standards-Based Architecture

Under the auspices of CIM, OSD established a working group in 1992 to develop an open-systems computer architecture and a joint systems acquisition strategy. That architecture reflects a consensus from OSD users and technical experts about the composition

of the next generation of workstations, networking, and other information resources. As existing IT support contracts expire, replacement decisions must consider a strategy for migrating to the SBA.

We base our recommendations on the final release documents that the SBA working group published in January of 1993.¹

REPORT OVERVIEW

This report consists of the following chapters and appendices:

- ◆ *Introduction:* This chapter establishes the purpose and scope of this report, discusses related DoD initiatives, and previews the other sections.
- ◆ *Functional Drivers:* Chapter 2 sets the functional context by discussing OEA's history, mission, functions, organizational structure, staff, and information requirements.
- ◆ *Current Technologies, Shortfalls, and Requirements:* Chapter 3 describes OEA's baseline IT environment, identifies shortfalls, and lists the general requirements (e.g., ease of use) that any new system should offer.
- ◆ *The New Environment — Recommendations:* Chapter 4 presents the near-term target solution that corrects the shortfalls of the current environment.
- ◆ *Migration Strategy:* Chapter 5 explains how OEA can move from its current situation to the new environment.
- ◆ *Equipment and Services Summary:* Appendix A summarizes the equipment and services that OEA should acquire to realize the target environment.
- ◆ *Proposed Migration Plan of Action:* Appendix B presents a tentative plan of action for OEA's IT modernization effort. (After reviewing our recommendations, the Director of OEA should revise and publish this plan.)
- ◆ *Federal Government Contracts and Resellers:* Appendix C lists those Government contracts and resellers that OEA might use to obtain the equipment and services listed in Appendix A.
- ◆ *Glossary:* Appendix D defines the acronyms used throughout this report.

¹DMR Corporation Report. *OSD Office Automation Standards-Based Architecture*, Version 1.0, January 1993.

CHAPTER 2

Functional Drivers

According to the principles adopted by OSD under the CIM initiative, an organization's mission, users, and business practices should dictate its selection and management of technology. To establish a functional framework for that technology, this chapter defines those aspects of OEA's business environment that "drive" its IT. Those drivers — mission, functions, organizational structure, staff responsibilities, and information usage — put the technology issues (discussed in subsequent chapters) into an appropriate, business-driven context.

BACKGROUND

The OEA oversees the Defense Economic Adjustment Program (DEAP). The DEAP helps communities cope with significant changes in the DoD, such as unexpected terminations of major weapon system contracts, base closures, and realignments. The OEA coordinates and tailors Federal, state, and local government resources to help offset any adverse economic impacts of those changes. Since its beginning in 1961, the DEAP has provided this assistance to over 500 communities. The President's Economic Adjustment Committee (EAC), a 23-member organization that represents multiple agencies, has provided technical and financial assistance to the DEAP since 1970. The OEA is the permanent EAC staff.

Mission and Functions

The OEA is a DoD field activity that reports to the Assistant Secretary of Defense for Economic Security [ASD(ES)] in the new Office of the Under Secretary of Defense for Acquisition and Technology [OUSD(A&T)]. In accordance with DoDD 3030.1 (entitled *Office of Economic Adjustment*), the Director of OEA is the principal staff advisor to the ASD(ES) on economic adjustment matters and certain other special events that concern the DoD. As described in the *OSD Organization and Functions Guidebook* (dated April 1991), OEA performs the following activities to fulfill its economic adjustment mission:

- ◆ Recommends policy, develops procedures, and manages resources to operate and improve economic adjustment programs
- ◆ Monitors changes in DoD programs and activities, predicts the effect of those changes, and develops plans to lessen any adverse impact (e.g., loss of jobs or revenue)

- ◆ Provides information and advice about economic adjustment programs and assistance resources to communities, individuals, and other organizations
- ◆ Plans, organizes, coordinates, and administers economic adjustment programs for areas adversely affected by DoD realignment and expansion, including efforts to ensure adequate facilities and services (e.g., affordable housing, roads, schools, water, and sewage)
- ◆ Manages grants for encroachment studies and joint-land-use planning to ensure that civilian development does not constrain base operations
- ◆ Provides technical advice and assistance to DoD-dependent communities that want to diversify their economic bases and to contractors developing new markets
- ◆ Coordinates DoD assistance activities across local, state, and Federal agencies as directed by DoDD 4165.61 (i.e., *Intergovernment Coordination of DoD Federal Development Programs and Activities*)
- ◆ Facilitates the conversion of surplus military facilities to civilian uses (e.g., airports, schools, etc.).

Organizational Structure and Responsibilities

Figure 2-1 shows how OEA is organized to carry out the mission and functions listed above. The OEA has the following positions:

- ◆ The *Director* supports the Secretary of Defense as the Chair and the ASD(ES) as permanent Vice Chair of the EAC by overseeing OEA's day-to-day operations.
- ◆ The *Deputy Director* assists the Director. This position is vacant.
- ◆ The *Community Economic Adjustment Military Assistants* are the Director's eyes inside the Military Departments. These three individuals (for the Army, Navy, and Air Force) act as liaisons between OEA and the Departments. They also sometimes assist with specific projects.
- ◆ *Senior Project Managers* oversee specific economic adjustment projects and programs. They handle more policy issues than other Project Managers.
- ◆ *Project Managers* oversee specific economic adjustment projects and programs that are usually less complex than those handled by Senior Project Managers.
- ◆ The *Administrative Staff* assists the other members of OEA with administrative tasks (e.g., typing, slide preparation, telephone calls, etc.).
- ◆ The *Computer Specialist* assists the other members of OEA with IT issues, such as training and data entry.

- ◆ The *Western Regional Office* is OEA's satellite office in Sacramento. That office, with its own Project Managers and Administrative Staff, handles economic adjustment matters on the West Coast.
- ◆ The *Grants Administrator* provides guidance on grant and cooperative agreement policies and procedures, performs basic analyses, and tracks grant and cooperative agreements requests.

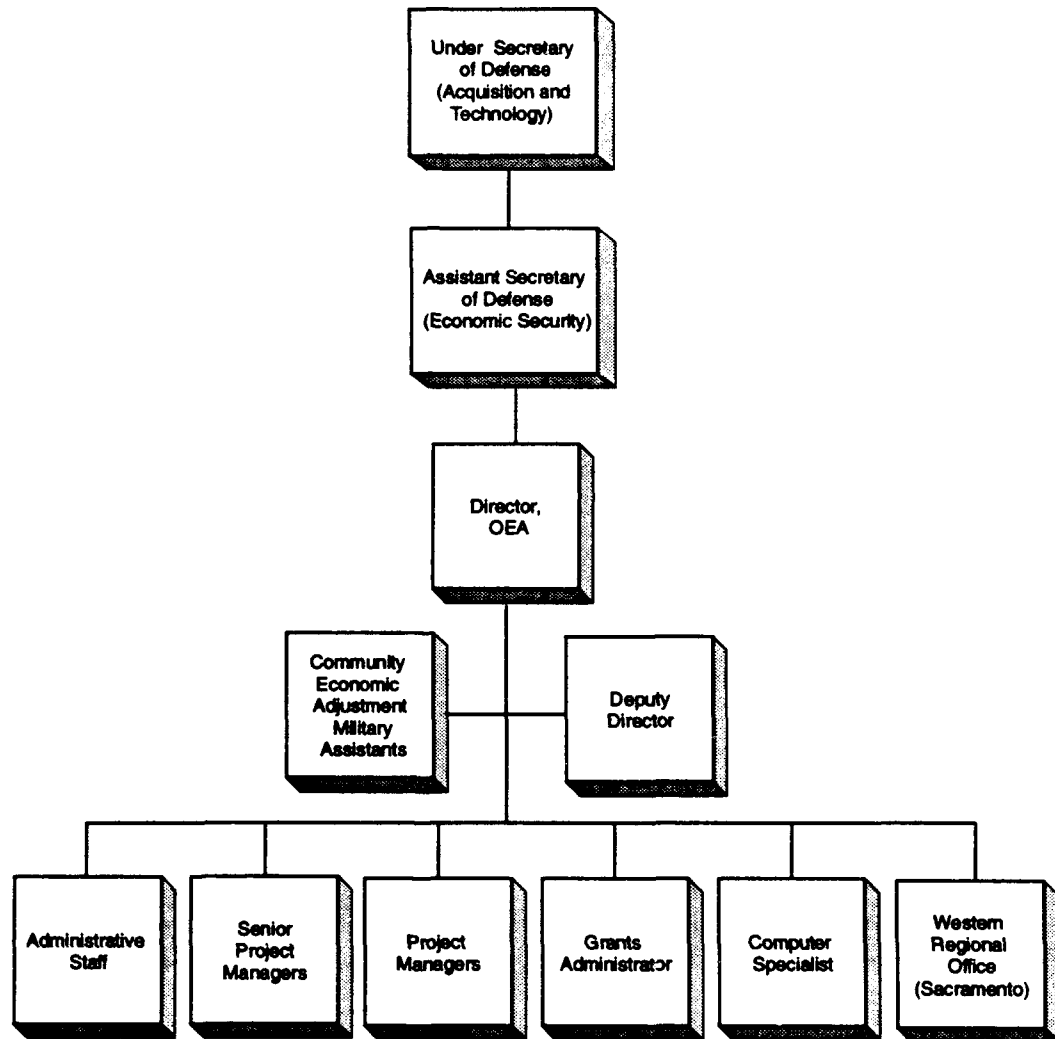


Figure 2-1.
OEA Organization Chart

INFORMATION REQUIREMENTS AND USE

This section summarizes the types of information that the OEA staff currently handles, where they typically get that information, and how they share the information received. While the OEA is primarily a paper-intensive operation, it is becoming more automated as technology and staff attitudes evolve. Therefore, OEA's IT must not only help the staff members to process paper better today, but it must also be ready to accept information in electronic formats as that paper is eliminated tomorrow.

Types and Sources of Information

Most of the information that OEA needs to perform its mission is textual: reports, correspondence, regulations, etc. OEA also handles graphics, such as maps, diagrams, and business charts. OEA's IT architecture must support the types of information listed below. When OEA is ready, it should contact its information sources to determine whether or not these data are available electronically.

- ◆ *Newsletters, agendas, and technical reports.* OEA staff members refer to a variety of newsletters, conference agendas, and technical reports from organizations such as the National Association of Installation Developers and the National Council of Urban and Economic Development.
- ◆ *Legislative documents.* The OEA tracks congressional bills and budgets (e.g., for defense appropriations) that might affect OEA and its client communities. Staff members also correspond with Senators and Representatives.
- ◆ *Regulations and policy.* Just as it tracks legislative activities, OEA must also monitor executive and administrative bodies such as the Small Business Administration, Department of Agriculture, Department of Commerce, and Department of Labor. Besides tracking the new rulings and other actions of those bodies, OEA staff must also refer to a variety of regulations and policies already published.
- ◆ *Manpower-related data.* The OEA uses information from the Defense Manpower Data Center to track force strengths and assess the impact of closures and realignments.
- ◆ *Socio-economic statistics.* The OEA needs national, regional, and local statistics related to employment and other socio-economic conditions.

Information Sharing

After an OEA staff member gains information, he or she must eventually share it with others. This sharing falls into one of the following categories:

- ◆ *Workgroup:* Much of the information that an individual handles must be shared with other members of a task force or project team, who are usually located in nearby offices.
- ◆ *Intra-OEA:* Another class of information sharing occurs OEA-wide. This type of sharing includes information exchanged between project teams, between executives and everyone else, and between the Sacramento and Washington offices.
- ◆ *External:* Individuals and teams within OEA communicate with a host of other DoD, governmental, and external parties.

Each part of the OEA information-use profile helps shape the target IT architecture. That architecture must support the data formats, types, sources, and sharing requirements described above. The next chapter describes how OEA's current IT environment supports those requirements today.

CHAPTER 3

Current Technologies, Shortfalls, and Requirements

This chapter describes OEA's current IT environment, identifies its shortfalls, and presents the requirements for new capabilities. We first discuss three aspects of OEA's current IT: the operating environment, applications and services, and management and support procedures. These aspects of the current environment comprise the OEA IT baseline, the modernization of which Chapters 4 and 5 describe. Throughout our discussion of this baseline, we also identify any gaps between OEA's needs and the capabilities of the current environment. We then generalize the shortfalls and summarize them as requirements for improvement.

OPERATING ENVIRONMENT

The OEA's current IT operating environment is dominated by equipment from Wang Laboratories of Lowell, Massachusetts. OEA has been using Wang equipment — primarily for word processing — for the past 9 years. In 1984, OEA purchased a Wang minicomputer, four workstations, and two printers, for approximately \$35,000. By 1986, OEA had upgraded to the Wang Virtual System (VS) environment, and it has added more workstations and other peripherals since then. The OEA began to acquire personal computers (PCs) in the late 1980s. The PCs were attached to the Wang VS for use as both Wang workstations and to run "off-the-shelf" software for spreadsheet analysis, data base management, and business graphics presentations. The PCs enable the OEA staff to exchange information with others using a widely accepted format, something the Wang does not support. Each component of OEA's current IT investment of about \$300,000 is detailed below. Component shortfalls are also discussed.

Workstations

Workstations enable users to access the office automation services provided by OEA's current IT. To support its staff, OEA uses the following types of workstations, some of which can access local dot-matrix printers (quantities are given in parentheses):

- ◆ *Diskless workstations (14)* are "dumb" terminals (i.e., screen and keyboard) that provide access to the Wang for word processing and limited spreadsheet analysis. They do not run any stand-alone software.
- ◆ *Wang 286 PCs (3)* are based on the Intel 80286 processor that can run some stand-alone software. At the same time, they are also connected to the Wang and operate as

diskless workstations. These PCs have tape backup units and monochrome monitors, which, according to users, are hard to read.

- ◆ *Compaq PC (1) and Wang 386 PC (1)* are based on the Intel 80386 processor and are connected to the Wang minicomputer. These IBM-compatible machines also support some stand-alone software (e.g., Lotus 1-2-3, dBase, and WordPerfect word processing). Currently, the Compaq is used as a two-machine file server for the OEA project management information system (PROMIS) discussed below. The Compaq can also operate under the Microsoft Windows operating environment. With some hardware upgrades, the Wang 386 PC would also support Windows. The Compaq has a video graphics adapter (VGA) monitor and the Wang has an enhanced graphics adapter (EGA) monitor.
- ◆ *Action 486 PCs (3)* are stand-alone PCs that operate under Windows. One is currently attached to the Compaq file server for PROMIS; all have VGA monitors.
- ◆ *Everex Notebook PCs (2)* are portable PCs based on the Intel 80386 processor. They have monochrome monitors and are used primarily by staff members while on travel.

Except for those that can operate under Windows, OEA's workstations do not support "multitasking," the ability to perform more than one computing task at the same time. Multitasking allows users to easily switch among applications and lets them continue working on the PC while a document is printing.

Wang Virtual System

The Wang VS minicomputer provides Wang office services to users through the PCs and diskless workstations connected to it. The VS has two removable, 76-megabyte hard disk drives currently operating at 75 percent capacity. The VS also features a 312-megabyte tape backup unit, a daisywheel printer, and three laser printers.

The daisywheel printer can produce letter-quality hardcopy through carbon paper (e.g., forms). Two of the three laser printers have a throughput of approximately 8 (black and white) pages per minute at 300x300 dots-per-inch (dpi) resolution. The third laser printer outputs 15 pages per minute at the same resolution. With the "resolution enhancement" feature enabled, these printers support the high quality hardcopy needed for final report publishing. However, the laser printers have two disadvantages: they are slow and they are awkward to access through the Wang software.

Although reliable for what it was designed to support, the Wang VS is a proprietary office automation solution that has become obsolete. It also presents a single point of failure (i.e., if it becomes unavailable, users cannot work locally). Some new employees have not received Wang training because it is no longer available. Based on recent bankruptcy proceedings for Wang Laboratories, this hardware platform represents a high risk.

Networking and External Interfaces

The OEA connects many of its workstations to the Wang VS with a local area network (LAN) of "thin" coaxial cabling. Each office has a wall outlet that provides workstation access to Wang's proprietary dual-coax cable plant. The cable plant connects each office outlet to a single patch panel as illustrated in Figure 3-1. The current LAN is not connected to any other sites (e.g., the Pentagon or Sacramento office). However, two PC workstations have 2400-bits-per-second (bps) modems for dialing up on-line information sources [e.g., bulletin board systems (BBSs)]. The OEA's current networking environment does not and cannot support many of the information sharing requirements described in Chapter 2.

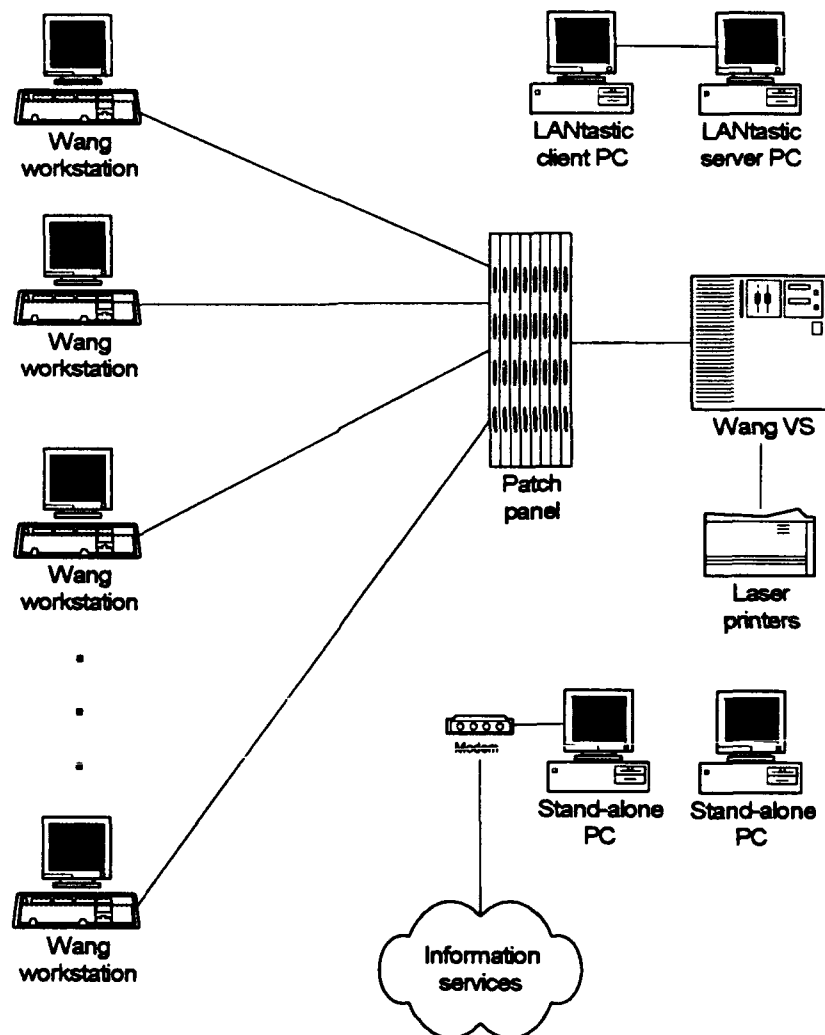


Figure 3-1.
OEA Current IT Architecture — Washington, D.C., Office

APPLICATIONS AND SERVICES

The mix of workstation platforms in OEA's current computer environment supports a variety of software applications and services. Unfortunately, most of these applications lack integration and feature command-line (not graphical) user interfaces. The majority of OEA staff members use the Wang VS, but nearly every project manager has been exposed to the Microsoft-disk operating system (MS-DOS) and/or the Windows environments. Many are familiar with WordPerfect word processing, Lotus 1-2-3, and dBase software. Comparatively fewer, however, have used software to create presentation graphics. The current applications and services are explored below.

Word Processing

Word processing is OEA's mission-critical office automation function. Staff members use Wang- and PC-based word processing services to create project status reports, document policies and procedures, and generate congressional correspondence. Documents are occasionally shared. While most of the staff uses the Wang VS for word processing, some use PC-based word processing packages such as MultiMate or WordPerfect. Neither the Wang nor the PC-based word processing software provide what-you-see-is-what-you-get (WYSIWYG—pronounced "wizzy-wig") output.

Data Base Management

Staff members track a variety of information using data base management software from Microsoft Corp. (FoxPro) or Borland Corp. (dBase). The OEA's PROMIS was developed with FoxPro to manage grants, travel, and other project-related information. Some staff members also use dBase for their own information management requirements. Standardizing on one data base management system would improve compatibility and might be more cost-effective to support.

Spreadsheet

Until PROMIS became available, most project management was done with spreadsheets using Lotus 1-2-3 on the PC or using 20/20 on the Wang. Today, many staff members still use Lotus 1-2-3 to track projects and to perform other financial analyses.

Project Management

Several years ago, OEA decided to implement a system that tracks project information. Initially, that system was merely a collection of Lotus 1-2-3 spreadsheets. OEA's PROMIS was developed as the number and complexity of spreadsheets grew. PROMIS contains grant, travel, and project information and provides a variety of reports for each type of information. Currently, PROMIS runs on a two-machine LANtastic (peer-to-peer)

network. Several enhancements are planned for this system, including a migration to Windows and the new environment described in Chapter 4.

Facsimile

The OEA has two stand-alone facsimile (fax) machines. Fax machines are used to transmit reports and correspondence to remotely located parties. All items must be in hardcopy format before they can be faxed, since the current networking environment does not provide direct on-line fax services.

Telecommunications

The OEA's current telecommunications capabilities are limited. OEA is connected to the Pentagon and Sacramento only by modem. Two 2400-bps modems and Procomm Plus software provide the only telecommunications capabilities.

Graphics

The Wang VS has limited graphics capabilities. Recently, PC-based graphics packages, such as Corel Draw and Harvard Graphics, have been used on the newer PCs to produce high-quality color graphics. Typical output includes state maps, briefing slides, and announcements. Currently, OEA only has black and white printing capabilities, but users want color output for presentation-quality slides and other graphics.

MANAGEMENT AND SUPPORT

The OEA has one staff member dedicated to technical support. While a single-person support staff satisfies OEA's current requirements, the target IT environment will be more complex than the existing one. Also, as described in the next section, OEA will need a more comprehensive training program.

GENERAL SYSTEM REQUIREMENTS

To correct the shortfalls identified above, Chapter 4 proposes an improved target environment based on the consensus of the SBA working group and generally accepted principles of system design. We recommend that the new system meet the following requirements:

- ◆ *Easy to use:* The new system must enable users to access office automation services from an integrated, graphically oriented, and familiar environment. The user interface will support the point-and-click, desktop metaphor. User interaction must be consistent across all applications (e.g., word processing and spreadsheet) and points of access (in the office, while traveling, at home, etc.). Information accepted under one

application must also be available to others (e.g., pasting a spreadsheet into a document). The system must interoperate with the systems and applications that the majority of staff members have at home (i.e., IBM-compatible PCs). Word processing must be WYSIWYG, and printing must be intuitive. Finally, a comprehensive training program must be developed to complement the new environment.

- ◆ *Responsive:* The new environment must meet user expectations for responsiveness, especially when printing. IT resources will acknowledge certain operations immediately (e.g., mouse movement). The response time for other requests must meet user expectations for those operations and be consistent over a given range of network loading (e.g., number of users logged on). The operating environment must provide multitasking to decrease user idle time during computationally-intensive activities.
- ◆ *Flexible:* The new environment must expand to meet new requirements and reflect the rapid advancement of technology, collateral jumps in user expectations, and the long lead times required for Government procurements.
- ◆ *Standards based:* The new environment must comply with all applicable external and internal standards (including those endorsed by SBA). Additionally, market forces (e.g., de facto industry standards) should heavily influence OEA's IT procurement decisions to promote cost-effectiveness and delay obsolescence.
- ◆ *Well connected:* The new system must allow OEA to share information electronically with parties at other locations. At a minimum, those locations will consist of the Pentagon (via the OSD network backbone) and the Sacramento office. Staff members on travel must also be able to communicate with OEA from their remote locations.
- ◆ *Reliable and secure:* No single system failure should prevent a user from accessing the new environment. If a network component fails (e.g., a server malfunctions), workstations will operate autonomously to provide limited information processing capabilities. If a workstation fails (e.g., a monitor malfunctions), users may access the office automation services from another workstation. The IT resources will provide transparent disk mirroring, unattended backups, and other fault-tolerant features to simplify recovery after system failures occur. Network services must be available 98 percent of the time; workstation availability must be at least 99 percent. The new system will also support OEA's security program to safeguard sensitive information from unauthorized disclosure. The new systems and procedures must protect all information from "viruses" and unauthorized tampering.

CHAPTER 4

The New Environment — Recommendations

This chapter recommends a new IT environment that corrects the shortfalls of the current one and meets the general requirements listed in Chapter 3. To describe the new environment, we first discuss the principles that guided our selection of commercial off the shelf (COTS) components. Then, we explain the operating environment and software applications and services. Finally, we describe the way that OEA should manage and support the new systems environment.¹

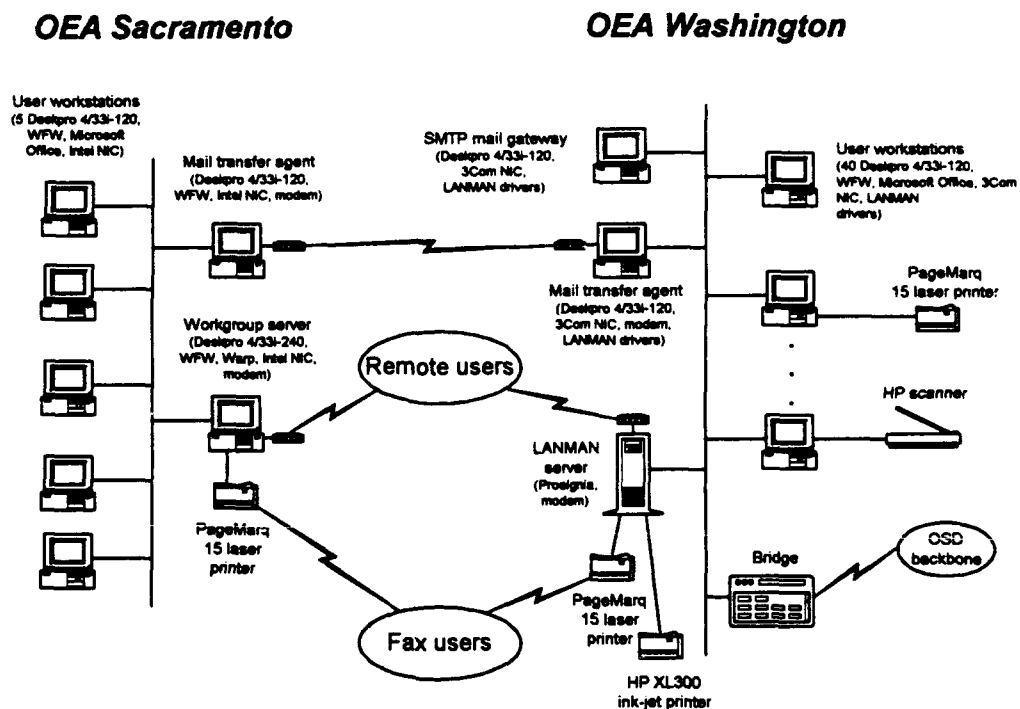
GUIDING PRINCIPLES

The following principles embody our philosophy for developing OEA's target IT architecture (i.e., the combination of hardware, software, and networking components shown in Figure 4-1). Appendix A translates these principles into COTS products. We recommend that OEA continue to apply these principles in the future as it refreshes its technology.

- ◆ The new IT environment must be open (i.e., nonproprietary) to promote competition and cost savings.
- ◆ The new environment must be standards-based by complying with all applicable Government and industry (i.e., de facto) standards. OEA will establish organization-specific standards when others do not exist or when unique situations dictate.
- ◆ The components of the new environment must interoperate with the data processing resources of organizations with which OEA shares information. The new equipment will communicate with standard OSD-wide office automation architecture proposed by the Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) [OASD(C³I)], DISA, or the SBA effort.
- ◆ The OEA's migration to the new environment must be evolutionary rather than revolutionary. New services must coexist with old ones during a predetermined transition period, giving users time to adjust while legacy systems are phased out.

¹ In both this Chapter and Appendix A, the recommendation of specific manufacturers' equipment does not imply that *only* these particular items will suffice. However, LMI's experience with this equipment gives us confidence in their individual and integrated capabilities. The OEA or the OSD procuring office may of course substitute other brands/models of equivalent capability. We suggest that OEA try to avoid accepting less reliable equipment simply because the bid price is lower.

- ◆ The OEA's IT procurements must use existing Government contracts whenever possible and comply with all applicable acquisition regulations.
- ◆ The OEA must adopt new technologies only when stable and cost-effective to do so. The OEA should consider the long lead time of Government procurements and the rate of technology advancement to determine when to acquire new equipment.
- ◆ The OEA must focus in the short term on replacing its obsolete office automation equipment with more capable, industry-standard components. Over the long-term, as the CIM reference model becomes more defined and industry components become CIM-compliant, OEA should align itself with OASD(C³I) and DISA guidance. The platforms recommended for short-term modernization should not preclude OEA from adopting Federal Information Processing Standard Publication (FIPSPUB) 146 [Government *Open Systems Interconnection Profile (GOSIP)*], FIPSPUB 151 (*Posix*), FIPSPUB 158 (*X-Windows*), and other CIM technical standards over the long term.



Notes: WFW=Washington Headquarters Services; NIC=network interface cards; SMTP=Simple Mail Transfer Protocol; LANMAN=Microsoft LAN Manager; HP=Hewlett-Packard.

Figure 4-1.
OEA Target IT Architecture

OPERATING ENVIRONMENT

Two workgroups — one in Sacramento and one in Washington — comprise the recommended operating environment. Each workgroup should feature PC workstations running Microsoft (MS) Windows for Workgroups (WFW), shared printers, external interfaces, and the other components discussed below. The Washington office should use the Microsoft LAN Manager (LANMAN) Network Operating System (NOS); the Sacramento office will not need it.

Sacramento Workgroup

We recommend the Sacramento office create a WFW workgroup that connects five user workstations with each other using thin-Ethernet coaxial cabling. For each workstation, we recommend the Compaq Deskpro 4/33i Model 120/w (or equivalent) upgraded to 8 megabytes (MB) of random access memory (RAM). These machines should have at least 100 MB of hard disk storage capacity and the other features listed in Appendix A to support the Microsoft "Office Suite" (Word for Windows, Excel for Windows, PowerPoint for Windows, and Mail) as described in the "Applications and Services" section below. WFW adds interactive networking functions to Microsoft Windows, the de facto standard operating environment for PCs, so users at the Sacramento office can share files, access the workgroup printer, and send electronic mail (E-mail) to each other. We recommend that OEA purchase one WFW "starter kit" and five WFW "user kits" for the Sacramento office.²

Besides workstations, the Sacramento office should also have a workgroup server. The workgroup "post office" would reside on the server, enabling Sacramento users to send and receive Microsoft Mail. The server would also connect to a Compaq PageMarq 15 for high-quality laser printing and faxing. Setting up the printer as a sharable WFW resource will let any workstation user get hardcopy output. When the PageMarq is connected to an external (analog) telephone line, it can generate plain-paper hardcopy from fax receipts and it can support outgoing fax transmissions. Users can send faxes from their software applications just as easily as they can print from them.

In our target architecture, the server also supports modem sharing and remote user access. Warp software from Performance Technology, Inc., allows remote users to dial into the server and access basic workgroup services (E-mail, printing, faxing, and file sharing). To support these functions, we recommend that OEA purchase a Compaq Deskpro 4/33i Model 240/w (or equivalent) for the Sacramento workgroup server.

The Sacramento mail "transfer agent" will exchange messages created in Microsoft Mail with a similar agent in Washington. Although we recommend a Compaq Deskpro 4/33i Model 120/w for both agents, less capable machines (i.e., those with Intel 80386 or

² The starter kit contains two Intel network interface cards (NICs) and enough thin-Ethernet cabling to connect two workgroup nodes. Each user kit includes one Intel NIC and cabling that connects an additional node. If the Sacramento office is wired by the Army Corps of Engineers before the new equipment is ordered, OEA should purchase just the WFW software, not the kits.

80286 processors) can also be used. During normal operation, the Sacramento mail transfer agent checks the workgroup post office (on the server) for any E-mail messages addressed to Washington recipients. When such a message appears, the mail transfer agent calls the Washington mail transfer agent via modem and public telephone lines, removes the message from the post office, and forwards it to the remote agent. The Washington agent receives the message and stores it in the Washington post office for later retrieval by the recipient.

Washington Workgroup

A greater number of workstations, LANMAN, and unshielded twisted pair (UTP) cabling distinguish the Washington workgroup from the one in Sacramento. For performance reasons, we recommend that OEA augment WFW on its Washington workstations with LANMAN and purchase a specialized server machine, such as the Compaq Prosignia Model 486DX2/66-1020.³ LANMAN, an NOS based on the OS/2 operating system, provides better network performance and management than WFW alone. Both WFW and LANMAN are Microsoft products and are well-integrated. Another difference between the Sacramento and Washington offices is the network media. Since the Washington office is large enough to justify a vendor-installed cable plant, we recommend UTP and 3Com networking equipment. UTP is more cost-effective, smaller in size, and usually more reliable than thin-Ethernet. UTP cabling and 3Com NICs would connect Washington user workstations, the LANMAN server, and other nodes to 3Com LinkBuilder repeater hubs.⁴

The UTP cabling and 3Com equipment let users share resources attached to the server and to individual workstations. We recommend that OEA connect a Compaq PageMarq 15 laser printer and a Hewlett-Packard (HP) XL300 ink-jet printer to the server. The PageMarq 15 provides high-quality laser printing and facsimile service; the HP XL300 provides color paper and transparency output. Washington users will share these resources via WFW and LANMAN. We envision that most of OEA's equipment in Washington — including the server and its peripherals — will reside on the second floor. Users on the first floor, however, need a printer of their own, so we propose that OEA connect an additional PageMarq 15 to a centrally located, first floor workstation.⁵ This workstation can be the standard Compaq Deskpro 4/33i Model 120/w or an older, less-capable machine. Users on the first floor can then share the PageMarq 15 through WFW. Finally, we recommend that OEA purchase an HP scanner and attach it to another workstation in similar fashion. The scanner will convert paper text and images to electronic files.

Members of the Washington workgroup will exchange E-mail with external organizations and individuals using a mail transfer agent, a network bridge, and a mail gateway. The Washington mail transfer agent will exchange Microsoft Mail messages with the

³ The server should provide at least 2 gigabytes (GB) of hard-disk storage capacity.

⁴ Although not shown in Figure 4-1, each repeater hub connects up to 12 network nodes. The repeater hubs are then connected together (to form a virtual LAN backbone) or to a physical backbone of thick or thin Ethernet cable.

⁵ LANMAN does not currently support PageMarq 15 printers directly connected to a repeater hub or network backbone (i.e., they must be connected to a server or a workstation). Microsoft and Compaq are aware of this limitation and, when they develop a fix, we recommend that the first-floor PageMarq 15 be connected directly to a hub on the first floor.

transfer agent in Sacramento as discussed earlier. However, since many organizations outside OEA do not use Microsoft Mail, the target architecture also includes a bridge to the OSD backbone and a Simple Mail Transfer Protocol (SMTP) gateway. The backbone will connect OEA to other OSD organizations, the Defense Data Network (DDN), and the Internet.⁶ The SMTP gateway allows OEA users to send (and receive) E-mail to (and from) DDN, Internet, and other OSD organizations just as they would exchange mail with other people in OEA. The gateway accepts SMTP-formatted mail through the bridge, translates it to Microsoft Mail format, and puts it in the recipient's mailbox on the LANMAN server. The gateway also checks the post office for any outgoing SMTP mail, translating and forwarding it as required. We recommend that OEA buy Compaq Deskpro 4/33i Model 120/w PCs for both transfer agent and gateway, although lesser capable 80286s or 80386s might be adequate.

The target environment for the Washington workgroup supports remote access by staff members on travel or by those in the Sacramento office. Remote users will use communications software, modems, and telephone lines to connect directly to the LANMAN server. Once connected, the remote user can access all LANMAN resources in the Washington workgroup. For example, a user on travel with a notebook PC could dial into the server and check her E-mail. Another user in Sacramento could print a document created with his PC on a PageMarq 15 in Washington.

APPLICATIONS AND SERVICES

The target operating environment will provide OEA staff members with a variety of new applications and powerful office automation services. As explained above, OEA users will be able to access those applications and services from within WFW. WFW provides E-mail, file sharing, calendar management, and workgroup scheduling in addition to the other services available under Microsoft LANMAN and Windows. Windows is easy to use, simplifies switching among tasks, and promotes data integration among applications.

We propose that OEA's new environment include the following Windows-compatible applications and services:

- ◆ *Word processing:* Use Microsoft Word for Windows as the standard word processing application. Word is a full-featured word processor that supports WYSIWYG editing, "drag and drop" text movement, spell checking, drawing, charting, and tables. Word is also well integrated with other software in the Microsoft Office Suite of applications (i.e., Excel for Windows, PowerPoint for Windows, and Mail).
- ◆ *Spreadsheet analysis:* Use Microsoft Excel for Windows as the standard spreadsheet application. Excel offers a comprehensive set of built-in functions, a robust macro language, extensive charting and graphing capabilities, and full compatibility with Lotus 1-2-3.

⁶ According to network operations personnel, the OSD backbone is accessible from the first floor in the building that OEA occupies. The OEA need only send a memo to the network managers and request a connection.

- ◆ *Presentation graphics:* For presentation graphics use Microsoft PowerPoint for Windows. PowerPoint allows users to create and manage high quality overhead transparencies, 35mm slides, and video screen presentations. This application includes over 400 clip-art images and a variety of sample backgrounds and templates.
- ◆ *Data base management:* OEA's PROMIS application was developed with Microsoft FoxPro. Use FoxPro for Windows as the standard data base management system. FoxPro consistently scores above other data base applications in processing speed. Its data files are also compatible with the existing dBase standard.
- ◆ *Electronic mail:* Use LANMAN, WFW, and Microsoft Mail. Mail supports message filtering, spell checking, and mailing lists. This application is well integrated with WFW and automatically provides notification to staff members when a group meeting is scheduled or changed.
- ◆ *Calendar management and group scheduling:* Use Microsoft Schedule+ as the standard WFW calendar management and scheduling application. Schedule+ scans the calendars of individual workgroup members and automatically selects the first available meeting time, tracks responses to meeting requests, and stores personal reminders for upcoming events.
- ◆ *Project management:* Use Microsoft Project for project management services. This application will help project managers control resources and costs by tracking deadlines and indicating overruns. Staff members can also use it to create Gantt charts, resource graphs, network diagrams, and a variety of reports. Project is compatible with dBase and Lotus 1-2-3.
- ◆ *Forms management:* For forms management, use Delrina's PerForm Pro Plus, the de facto standard OSD forms processing application. OEA can use PerForm Plus to design new forms, as well as fill in many that already exist, electronically. PerForm Plus supports routing lists and digital signatures.
- ◆ *File sharing:* The target architecture provides file sharing in several ways. At a basic level, staff members can attach copies of individual files to Microsoft Mail messages and send them to other users. Users can also designate files on their local hard disks as "shared," giving anyone in their workgroups access to them. Finally, files can be copied to the LANMAN server (using the Windows file manager or MS-DOS commands) for access or retrieval by others.
- ◆ *Printing and faxing:* As mentioned earlier, the target environment will let users print or fax from any Windows application through the Compaq PageMarq 15. Users who send files to a PageMarq 15 are given the option to fax them instead of printing. If the user selects fax, he or she is prompted for the fax number and other information. PageMarq 15s also have a dedicated telephone number to which outsiders can send faxes. When used with the HP scanner in Washington, PageMarq 15 printers make desktop fax machines obsolete. The Washington office also has the HP XL300 color ink-jet printer accessible from any Windows application.

- ◆ *Telecommunications:* Use Microsoft Remote Access Service, Procomm Plus for Windows, and Qmodem⁷ to support dial-in and dial-out communications. Microsoft Mail Gateway to SMTP can also link the OEA mail system with DDN and Internet mail.
- ◆ *Backup and recovery:* To back up the Washington LANMAN server, use the HP JetStore digital audio tape (DAT) backup unit. This device and its accompanying software will enable system managers to restore damaged or lost files.

MANAGEMENT AND SUPPORT

The IT environment that we recommend is more powerful and complex than the current one. To ensure that users realize the new environment's full potential, OEA must manage and support the new architecture effectively. To this end, our recommendations for training, technical support, and security are given below.

Training

Staff members throughout OEA differ widely in their aptitudes and attitudes toward automation. We recommend that OEA purchase a wide variety of training services, including provisions for stratified training (e.g., grouping of training classes by user needs and attitudes). The training program should provide initial instruction about new equipment as well as follow-on, desk-side assistance for individuals or small groups in a convenient meeting area. The OEA system managers should also establish a user discussion forum early in the transition period to answer any questions and discuss problems that arise. These meetings will keep the staff informed of any changes to the system. Fortunately, one advantage to Windows is its consistent user interface across different applications. That interface characteristic will make it easier to implement the training program.

Technical Support

As users begin to rely more on the capabilities of the new environment, failure prevention and resolution become critical. Sufficient technical support personnel — both in numbers and in experience — are necessary to ensure a smooth transition and long-term productivity gains. We recommend that OEA retain one full-time system technician and outsource to meet its other technical support needs. Shortly after the initial installation, OEA should establish a block-time service contract with a third-party support provider. Under that contract, technical support personnel would report on-site within a matter of hours to resolve a problem. The full-time system technician would handle any minor issues and would work with third-party technicians as needed.

⁷ Qmodem, telecommunications software, is required to interact with certain BBS functions.

Security

Currently, OEA stores all of its classified information on paper only. While this practice will continue in the new environment, OEA must still concern itself with disaster preparedness and data recovery. We recommend off-site storage of tapes created during automatic server backups. The OEA should perform nightly incremental backups (i.e., only those files that changed during the day) and full backups every week. The OEA should store the incremental tapes locally in a safe or locked cabinet. Three generations of full backup tapes should be kept, with the newest set stored at OEA and the other two stored off-site. In addition to backing up the server, each user should also be trained to back up important files themselves. OEA should also regularly scan storage devices for viruses and conduct annual audits to ensure that the current software configuration complies with all licensing agreements.

CHAPTER 5

Migration Strategy

In the previous chapter, we recommend technologies to correct shortfalls in OEA's current information processing capabilities. This chapter proposes a strategy for implementing these recommendations by first identifying OEA's goals for meeting its IT-related requirements. We discuss the issues that should be resolved before the actual migration to the new environment begins. For each issue, we identify the alternatives available and make recommendations. Based on those recommendations and the goals identified earlier, we then propose the actions that OEA must complete to realize the target systems environment. The OEA should review our recommendations and proposed actions, and publish its own plan of action for IT modernization. By completing the tasks listed in the plan, OEA will ultimately achieve its migration goals.

MIGRATION GOALS

Chapter 2 presented OEA's requirements for information collection, sharing, processing, and presentation. To satisfy those information requirements, OEA should adopt the following goals:

- ◆ Modernize the IT infrastructure by replacing the Wang components with more capable, industry-standard components.
- ◆ Ensure that the new infrastructure and the people that use it are adequately supported.
- ◆ Improve business practices to exploit the new infrastructure.

IMPLEMENTATION ISSUES AND RECOMMENDATIONS

This section identifies the issues that OEA must resolve before it can achieve the migration goals listed above. We encourage OEA to discuss these issues, reach a consensus for each, and publicize the decisions reached. To stimulate that process, we describe each issue, identify the alternatives available, and make recommendations.

Developing Procurement and Funding Strategies

This report gives OEA enough information (e.g., cost estimates and equipment specifications) to develop viable procurement and funding strategies. The procurement strategy must describe how to purchase the equipment (hardware and software) and services (e.g., technical support, maintenance, and training) described in Chapter 4. The funding strategy must describe where OEA will get the money to acquire and support this new environment.

Because of the long lead times required, we recommend that OEA begin developing these strategies immediately. As a first step, OEA should contact Defense Supply Service — Washington (DSS-W).

In general, OEA can acquire the equipment and services it needs to establish the target environment using one or more of the approaches listed below. DSS-W can provide additional details about each of these alternative approaches and may even suggest other options.

- ◆ *Use an existing Government contract:* Typically, defense agencies can order products through vendors already under Government contract. The OEA should evaluate all existing contracts as possible procurement vehicles. The OUSD(A&T), OEA's parent organization, currently manages a contract with GTE that contains most of the products discussed in Chapter 4. The recently awarded Desktop IV contract may also meet OEA's requirements. Appendix C provides a sample of other Government contractors and resellers on the General Services Administration (GSA) Schedule that currently provide some or all the equipment and services that comprise the target environment.
- ◆ *Establish a new contract:* As a DoD field activity, OEA has direct procurement authority to establish its own contracts for equipment and services. Unfortunately, the proposal, bidding, and contract award process is very long and not cost-effective for OEA to pursue. An exception might be the "8A Set-Aside Program." The OEA should investigate this option with DSS-W and determine if it is available. If it is, DSS-W can help OEA prepare a statement of work and award a contract to a minority-owned or small business much faster than if normal contracting procedures are used.
- ◆ *Arrange for DISA support:* DMRD 918 is consolidating defense IT procurement authority and support under DISA. As part of this consolidation, DISA's Defense Commercial Communications Office (DECCO) is establishing a new system for acquiring COTS products and services. The IT Acquisition Bulletin Board System (ITABBS), when fully implemented, will reduce procurement lead times and promote volume discounts. Also, the Air Force 7th Communications Group (7CG) directorate that supports OSD is now part of DISA. Consequently, OEA may be entitled to receive services that the 7CG and contractors provide to other OSD organizations (e.g., the help desk). The OEA should discuss its needs with DISA to determine the scope of support currently available.

As the overall defense budget shrinks, OEA may have trouble funding its modernization. Also, the procurement strategy chosen may restrict the types (e.g., procurement versus operations and maintenance) and amounts of money that OEA can spend. The OEA should discuss the funding sources and spending thresholds with contracting and budget officials. The OEA must ensure that its budget requests allow it not only to acquire the new equipment, but continue to support it well into the future.

Managing the Transition

The OEA's challenge in migrating to the target environment is more managerial than technical in nature. Chapter 4 recommends an IT solution based on industry standard, COTS components. The IT solution represents little risk from a technical perspective. The management issues, however, will be demanding. Historically, OEA has assigned IT-related duties to people on a part-time basis. This practice requires the part-time person to juggle his or her IT-related responsibilities with other commitments. Another option is to obtain a dedicated person to do the work.

Because of the level of effort involved, we recommend that OEA hire or appoint a full-time transition manager to supervise the migration. This manager would direct the transition team, coordinate all contracting issues with Washington Headquarters Services (WHS) staff and OEA executives, and oversee a systems integrator retained to perform most of the technical work. The manager should report to the Director of OEA on all aspects of the transition process, validate vendor performance, and ensure prompt payment as the work proceeds.

Providing Technical Support

Although many of the COTS products recommended are easy to use and require little maintenance, some technical support is needed to ensure that users fully exploit the new environment. That support should include training, troubleshooting and repair, preventive maintenance, software development, and general consulting. In private industry the average number of support persons is one for every 10 to 30 users. By this standard, OEA would need 2 to 4 full-time consultant/technicians for a community of 40 to 50 users. The OEA can build its own internal support staff, outsource its requirements, or rely on a combination of the two.

We recommend that OEA hire or appoint one person for technical support and use outsourcing as needed for any additional requirements. Preferably, the OEA transition manager would become the internal support contact after the new equipment is installed. Then, as the transition activities start to subside, the manager could shift his or her attention from implementation planning to technical support. This person would perform many of the tasks listed above and be the first person to address problems as they arise. The OEA support contact person would also function as a liaison by coordinating with non-OEA parties such as OSD network managers, equipment vendors, and resellers.

Selecting Vendors and Resellers

Depending upon the procurement strategy chosen, OEA's selection of possible equipment and service providers is likely to be limited. OEA might be forced, for example, to buy its hardware, software, training, and technical support from different vendors. In our experience, the complexity of managing the transition will rise exponentially with the number of providers involved. Therefore, we recommend that OEA select a single, value-added

reseller to provide the equipment listed in Appendix A, set it up, support it, and train users to operate it.

The DSS-W can help OEA find a reseller that meets its specific requirements. In the near term, OEA needs someone who can work closely with the transition manager to develop detailed implementation schedules, cabling diagrams, equipment specifications, training plans, maintenance agreements, and cost estimates. The transition manager would then review those planning materials, finalize equipment orders, and negotiate with the reseller for installation and support services. Once those negotiations were complete, the reseller would begin installing the new equipment.

Installing the New Equipment

After publishing an organizational plan of action, developing a procurement strategy, and selecting a reseller, OEA can begin to install new equipment. During this phase, the reseller will install, test, and certify the network cable plant as well as set up the file server and client PCs. The implementation schedule that the transition manager develops with the reseller will specify who gets the new equipment first. Therefore, OEA must decide whether to make the transition for everyone at once, one user at a time, group by group, etc. The most important factor in determining how to sequence the installations is minimizing the disruption to end users. The OEA must also consider other factors, such as contract delivery schedules and the recent influx of 15 new employees.

We recommend, unless the vendor delivery schedule cannot support it, that OEA install all of the new equipment at once. We estimate that the entire installation will take 10 working days. If the installations must be spread out over a longer period, then OEA should provide new workstations for the 15 new employees first. The transition manager should ensure that new user training coincides with the new equipment installations.

Training

Users need information about their new IT resources and any new operating or management procedures that OEA establishes to support those resources (e.g., how to reach technical support). To use their new systems productively and fully, users must be trained initially, whenever a new IT component is added, and whenever a support procedure changes. The OEA has many options for training. Should the training occur on- or off-site? Should the users be trained one-on-one or in groups? Who should be trained first? How much time should users spend in training? Who should conduct the training (i.e., OEA, other Government trainers, or a commercial training provider)? What topics should the training cover?

We recommend that OEA select a value-added reseller who can provide not only equipment and technical support, but training as well. We recommend that the reseller provide a combination of off-site group classes and on-site, one-on-one instruction. The off-site classes should be half-day tutorials about the Windows environment and the specific software components of the target environment. The one-on-one training should be available on demand during the first month of operation and whenever new software is

introduced. The OEA transition manager should work with the training provider to develop the course schedule and curricula. As mentioned earlier, the training must be closely coordinated with the new workstation deliveries. Users should not receive the new workstations until they have received at least some introductory training.

Phasing Out Legacy Systems

Once the new systems are operational and the users are trained, OEA should begin to phase out the Wang components. Users must be notified of the cutoff date and given incentives to use their new IT resources. The OEA can phase out the Wang components gradually or abruptly. A "parallel" migration environment would give users temporary access to both the Wang and the new technologies during a predetermined transition period. This option allows users to adopt the new equipment as their workloads permit, but it requires both systems to be maintained for a period. On the other hand, OEA might want to deactivate the Wang as soon as the new systems become available. This option puts a greater strain on users but speeds up the transition. Regardless of the option OEA chooses, it must decide how to convert the format of its archived documents and those still being developed.

If OEA continues to occupy the same office space, we recommend that it operate the Wang system parallel with the new system for a 60-day transition period. Before the transition period begins, we recommend that OEA audit its current document archive and identify documents to be converted. We recommend that all new documents be created and maintained using the new applications and that any Wang documents still in progress be converted whenever convenient.

Protecting Information

The OEA must protect its information once converted and stored on the new system. Information protection issues are many: Should users be allowed to bring software from home or download it from bulletin boards and load it on their work PCs? How will OEA protect against, detect, remove, and recover from virus infections? How often will back-up files be saved? For each of these issues, OEA faces a tradeoff between safeguarding data and convenience.

We recommend that OEA assess the vulnerability of its information and IT resources, develop a plan to deal with those vulnerabilities, and establish operating instructions and management procedures to achieve that plan's objectives.

Networking

Many of the issues that OEA must resolve before finalizing its organizational plan of action are related to networking. We discuss networking issues below and offer our recommendations for each.

- ◆ *Media:* As described earlier, OEA's existing cable plant is based on thin Ethernet and a patch panel. The OEA could use this cabling in the target environment to save costs and minimize user disruption. This approach, however, would not be as reliable as new cabling nor would it allow OEA to operate the Wang system parallel with the recommended new systems. Finally, the existing cable plant will not support the 15 or so new OEA employees. For these reasons, we recommend that OEA abandon the existing cabling and install new UTP cabling for the new network. However, before adopting this recommendation, OEA should check any building restrictions concerning new cabling.
- ◆ *Local versus server-based storage of applications:* The target environment proposed earlier allows OEA users to store software applications either locally (on their workstations) or on the LAN server. If the files are stored on the server, the NOS will automatically copy the files into local RAM when the application executes. Storage of applications locally is more fault-tolerant and slightly faster, but it normally requires that each user workstation have a larger hard disk. Another advantage to storing applications on the server is better configuration management (e.g., upgrades are easier to implement). Therefore, we recommend that OEA store Windows and the standard office software applications on the LAN server. The networking solution described earlier is very reliable; unplanned network outages—which make server-based applications unavailable—would be rare.
- ◆ *Word for Windows:* The OEA could use WFW without an underlying NOS. This alternative would reduce costs at the expense of expandability, response time, and ease of network management. We feel that the tradeoffs do not outweigh the cost savings; therefore, we recommend that OEA use both WFW and an NOS at the Washington office.
- ◆ *Connecting to the Sacramento office:* The OEA can connect to the Sacramento office by bridging subnetworks or with a mail gateway. Bridging the Washington subnetwork with the Sacramento subnetwork would allow users at both locations to share files stored on each other's LAN servers. This alternative would be more costly than a mail gateway, however. A mail gateway would allow file sharing but only through the mail system (i.e., users would have to mail each other those files they wanted to share). We recommend that, at least in the near term, OEA use a mail gateway to connect the two offices. Microsoft Remote Access Service will provide additional conductivity as needed.
- ◆ *Connecting to non-OEA entities:* The OEA must sometimes correspond electronically with users at the Pentagon and other locations around the world. Many alternatives exist for establishing the necessary electronic bridges—dial-up connections to the DDN, an Internet connection via a third-party provider, mail gateways to OUSD(A&T), etc. We recommend that OEA negotiate with DISA and the Pentagon

network managers for an entry point into the OSD network backbone. Such a connection would allow OEA users to share files with OUSD(A&T) and correspond with anyone on the DDN or Internet.

Standardization and Process Re-engineering

As the DoD restructures itself to operate in a post-Cold War, budget-constrained era, many initiatives similar to the Standards Based Architecture (SBA) will emerge. A primary conclusion from the SBA working group is to keep DoD in the mainstream of COTS products; we recommend that OEA do the same. Our recommendations are based on current industry standards and the recommendations of the SBA working groups. The OEA should stay informed about all OSD and DoD standardization efforts as well as guidance on business process re-engineering.

It is likely that OEA's current business practices can be streamlined and reorganized given the superior capabilities of its new environment. The OEA should realize that the new technologies can enable change. For example, the new systems may help highlight redundancies and non-value-added practices, which OEA can then eliminate. Although it generally makes sense to re-engineer business processes before selecting the IT that supports them, OEA has neither the time nor money to build a functional architecture, develop process models, etc., before migrating from the Wang system. After the CIM initiative finalizes its methodologies for DoD re-engineering efforts, OEA should consider applying them to streamline its business practices and more closely align them with its organizational mission.

Refreshing Technology

Even the state-of-the-art environment we have described will eventually become obsolete. The OEA plan of action must describe how to keep the target environment continuously refreshed once established. For example, OEA may want to replace its workstations with notebook PCs and desktop "docking" stations to better serve traveling users. We recommend that OEA build technology refreshment provisions into its procurement and funding strategies and then work with vendors to implement those strategies.

PROPOSED MIGRATION ACTIONS

The planning, migration, and ongoing activities described below will enable OEA to realize its migration goals and correct the IT-related shortfalls discussed earlier. By breaking the entire transition effort into a series of carefully controlled activities, OEA will enhance its ability to manage the change process and improve its chance of success. Some of these actions can proceed in parallel; so we recommend that OEA incorporate them into an organizational plan of action, publish it, and begin to execute it. Appendix B lists the necessary steps in tabular form.

Planning Activities

The OEA should begin the following actions now and complete them during the next 6 months:

- ◆ Appoint a transition manager and team
- ◆ Identify viable procurement options and sources of funding
- ◆ Work with DSS-W to develop a procurement strategy
- ◆ Select equipment and service vendors
- ◆ Finalize equipment and service requirements, determine funds availability, and place orders with vendors
- ◆ Perform a vulnerability assessment and develop an information systems security plan
- ◆ Get authorization to install network cabling from the building manager
- ◆ Work with Pentagon telecommunications managers to arrange for access to the OSD network backbone
- ◆ Negotiate with telecommunications carriers for connections to the Pentagon and the Sacramento office
- ◆ Audit all existing Wang data files and identify those to be converted
- ◆ Develop a strategy for Wang equipment and documentation disposal.

Migration Activities

Once the planning activities are complete, OEA and its agents can begin the following actions:

- ◆ Install the cable plant
- ◆ Unpack, configure, connect, and test the new user's PCs
- ◆ Conduct initial user training
- ◆ Convert Wang data files to Word for Windows format
- ◆ Integrate the OEA BBS into the new environment
- ◆ Install mail transfer agents and establish a connection with the Sacramento office

- ◆ Install SMTP mail gateway hardware and software and establish a connection with the OSD backbone
- ◆ Work with system developers to incorporate the new grant management system into the target environment
- ◆ Remove and dispose of the Wang equipment.

Ongoing Activities

Throughout the migration process and after the target environment has been implemented, OEA should undertake the following actions:

- ◆ Monitor vendor performance
- ◆ Ensure that annual budgets include funding for information resource management (IRM) initiatives and that vendors are paid promptly
- ◆ Coordinate network administration with OSD network managers (e.g., maintaining entries in mail directories)
- ◆ Upgrade hardware and software
- ◆ Establish a program for training new and existing users
- ◆ Work with the CIM office to transform DoD-wide recommendations for business process re-engineering into an OEA-specific strategy.

APPENDIX A

Equipment and Services Summary

This appendix summarizes the equipment and services the Office of Economic Adjustment (OEA) should purchase to modernize its information technology (IT). Table A-1 lists the components and services required and their estimated costs. These costs are based on prices taken from the current General Services Administration (GSA) Schedule, product literature, and discussions with vendors. Our cost estimates do not reflect any volume discounts (i.e., OEA may be able to negotiate lower prices if it purchases everything from the same vendor).

Table A-1.
Recommended Equipment and Services

Description	Qty.	Unit price (\$)	Item total (\$)
<i>User workstations</i>			
Compaq Deskpro 4/33i Model 120/w PC (includes Intel i486/33-MHz processor, ISA bus, 4MB RAM, 120MB hard disk, MS-DOS 5.0, Windows 3.1, QVision color VGA video and monitor, mouse, 3.5-inch and 5.25-inch floppy drives, and integrated business audio)	45	2,050	92,250
4MB RAM expansion kit	45	500	22,500
3Com EtherLink III TP network adapter and driver software (supports IEEE 802.3 over unshielded twisted pair)	42	125	5,250
Microsoft WFW upgrade	42	75	3,150
Microsoft Office for Windows (includes Word for Windows, Excel, PowerPoint, and Mail)	45	475	21,375
Microsoft WFW Starter Kit (includes networking and software for 2 workstations)	1	625	625
Microsoft WFW User Kit	5	325	1,625
			146,775

Note: Acronyms are defined in the Glossary, Appendix D.

Table A-1.
Recommended Equipment and Services (Continued)

Description	Qty.	Unit price (\$)	Item total (\$)
<i>Network servers and gateways</i>			
Compaq ProSignia PC server Model 486DX2/66-1020 (includes 1.02GB hard disk drive, 8MB RAM, and 32-bit network adapter)	1	7,600	7,600
1.05G Fast SCSI-2 hard drive for Compaq ProSignia	1	1,800	1,800
9600 bps Hayes-compatible fax/modems	4	300	1,200
Compaq Deskpro 4/33i Model 120/w PC (includes same features as workstations listed on page A-1, used for mail transfer agents and SMTP gateway)	3	2,050	6,150
Compaq Deskpro 4/33i Model 240/w PC (includes same features as workstations listed on page A-1; they are used for Sacramento server)	1	2,200	2,200
HP JetStore 2GB DAT backup (includes software; used for Washington server)	1	1,800	1,800
Microsoft LAN Manager NOS (for first 10 users)	1	1,325	1,325
Microsoft LAN Manager NOS (for each additional 10 users)	4	675	2,700
Microsoft LAN Manager Remote Access Service	1	500	500
Microsoft LAN Manager TCP/IP protocols	1	300	300
Microsoft Mail Gateway to SMTP	1	3,000	3,000
Microsoft Mail Service (for 40 users)	1	1,500	1,500
Microsoft Mail and Schedule+ Extensions to Windows for Workgroups	1	375	375
Warp Remote Access Service for Windows for Workgroups	1	100	100
3Com ISOLAN 1400 bridge and modem (for connecting the Washington LAN to the OSD backbone)	1	2,000	2,000
			32,550
<i>Network cabling and installation</i>			
3Com LinkBuilder FMS TP repeater hub	5	725	3,625
3Com hub expansion cable	4	50	200
Cable plant and installation (includes unshielded twisted pair wiring, cable connectors, wall plates, labor to connect 40 workstations and mail gateways with server and repeater hubs, and labor to install network adapters and drivers)	1	3,000	3,000
			6,825

Table A-1.
Recommended Equipment and Services (Continued)

Description	Qty.	Unit price (\$)	Item total (\$)
<i>Network peripherals</i>			
Compaq PageMarq 15 laser printer (includes 4MB RAM, 800x400 maximum dpi resolution, internal fax/modem, PostScript Level 2, and PCL 5 compatibility)	3	3,125	9,375
4MB memory expansion kit	3	325	975
Legal size paper tray	3	100	300
LaserTools fax software	1	300	300
HP XL300 Color Printer	1	2,300	2,300
Scanner and optical character reader software	1	1,500	1,500
			14,750
<i>Third-party technical support</i>			
12 months of on-site maintenance for network hardware, LAN administration service, unlimited telephone support, and software updates	1	12,000	12,000
			12,000
<i>Additional software</i>			
Microsoft Project	1	425	425
ProComm Plus for Windows	1	100	100
Corel Draw	1	400	400
Backup Utility	1	125	125
PerForm Pro Plus for Windows	1	225	225
Microsoft FoxPro for Windows	1	500	500
Qmodem	1	100	100
			1,875
<i>Supplies and miscellaneous items</i>			
HP 2GB DAT (5 pack)	5	67	335
Compaq PageMarq 15 laser printer cartridge kit	6	200	1,200
HP XL300 color printer cartridges (4 colors each \$18)	20	18	360
1200 volt-amp uninterruptible power supply (for the Washington server)	1	2,000	2,000
			3,895
Total estimated cost			\$218,670

APPENDIX B

Proposed Migration Plan of Action

This appendix summarizes the actions the Office of Economic Adjustment (OEA) should complete to modernize its information technology (IT). Table B-1 lists those actions, first presented in Chapter 5, in a format that will help the OEA manage the modernization process. The OEA should review this format, fill in the blank columns, and publish the table as the official plan of action for its effort.

Table B-1.

Near-Term Plan of Action for OEA's Information Technology Modernization Effort

Action	Date due	Date complete	Person(s) responsible	Status
1. Appoint a transition manager and team				
2. Identify viable procurement options and sources of funding				
3. Work with DSS-W to develop a procurement strategy				
4. Select equipment and service vendors				
5. Finalize equipment and service requirements, determine funds availability, and place orders with vendors				
6. Perform a vulnerability assessment and develop an information systems security plan				
7. Get authorization to install network cabling from the building manager				

Note: Acronyms are defined in the Glossary, Appendix D.

Table B-1.***Near-Term Plan of Action for OEA's Information Technology Modernization Effort
(Continued)***

Action	Date due	Date complete	Person(s) responsible	Status
8. Work with Pentagon telecommunications managers to arrange for access to the OSD network backbone				
9. Negotiate with telecommunications carriers for connections to the Pentagon and the Sacramento office				
10. Audit all existing Wang data files and identify those to be converted				
11. Develop a strategy for Wang equipment and documentation disposal				
12. Install the cable plant				
13. Unpack, configure, connect, and test the new-user PCs				
14. Conduct initial user training				
15. Convert Wang data files				
16. Integrate the OEA BBS into the new environment				
17. Install mail transfer agents and establish a connection with the Sacramento office				
18. Install SMTP mail gateway hardware and software and establish a connection with the OSD backbone				
19. Work with system developers to incorporate the new grant management system into the target environment				
20. Remove and dispose of the Wang equipment				

Table B-1.

***Near-Term Plan of Action for OEA's Information Technology Modernization Effort
(Continued)***

Action	Date due	Date complete	Person(s) responsible	Status
21. Monitor vendor performance				
22. Ensure that annual budgets include funding for IRM initiatives and that vendors are paid promptly				
23. Coordinate network administration with OSD network managers (e.g., maintaining entries in mail directories)				
24. Upgrade hardware and software				
25. Establish a program for training new and existing users				
26. Work with the CIM office to transform DoD-wide recommendations for business process re-engineering into an OEA-specific strategy				

APPENDIX C

Federal Government Contracts and Resellers

This appendix lists Government contracts and Government resellers that the Office of Economic Adjustment may be able to use to obtain hardware and software.

GOVERNMENT CONTRACTS

- ◆ American Telephone and Telegraph (AT&T) (OATS), (800) FAA-OATS, DTFA01-90-D-00009
- ◆ AT&T (SMSCRC), (800) DIAL-251, F-19630-88-D-0005
- ◆ Elbelco (AFNAF), (800) 938-0911, F-41999-91-D-6024
- ◆ Electronic Data Systems (EDS) Small Multiuser Computer (SMC), (800) SMC-EDI1, DAHC94-90-D-0012
- ◆ Federal Computer Corp. [Defense Mapping Agency (DMA)], (714) 646-5519, DMA600-90-D-0004
- ◆ Government Technology Services, Inc. (GTSI) (for Navy Companion), (800) 395-4874, #N66032-91-D-0002
- ◆ Lockheed (NOAVA), (800) 800-NOAV, V101 (93) P-136
- ◆ Unisys (Desktop III), (800) 332-3127, F-01620-90-D-0001
- ◆ Unisys (GSAS), (703) 556-5325, GS-00K-92-AFD-2700
- ◆ Zenith (Desktop IV), (800) 843-4131

GOVERNMENT RESELLERS

- ◆ (800) SOFTWARE, (800) 888-4880, GS-00K-92-AGS-6037
- ◆ Compucom, (703) 761-2340, GS-00K-92-AGS-5448
- ◆ Egghead Discount Software, (800) 669-9997, GS-00K-92-AGS-6160; Washington, D.C., (800) 786-4344

- ◆ Falcon Microsystems, (800) 284-1367,GS-00K-92-AGS-6033
- ◆ GTSI, (800) 999-4874, GS-00K-92-AGS-6084
- ◆ I-NET, (800) 758-INET, GS-00K-93-AGS-6171
- ◆ JWP, (800) 597-4GSA, GS-00K-92-AGS-6021
- ◆ Softmart, (800) 628-9091, GS-00K-92-AGS-5465

APPENDIX D

Glossary

ASD(ES)	=	Assistant Secretary of Defense for Economic Security
AT&T	=	American Telephone and Telegraph
BBS	=	Bulletin Board System
bps	=	bits-per-second
CIM	=	corporate information management
COTS	=	commercial off the shelf (software)
DAT	=	digital audio tape
DDN	=	Defense Data Network
DEAP	=	Defense Economic Adjustment Program
DECCO	=	Defense Commercial Communications Office
DISA	=	Defense Information Systems Agency
DMA	=	Defense Mapping Agency
DMR	=	Defense Management Review
DMRDs	=	Defense Management Report Decisions
DoDD	=	DoD Directive
DOS	=	disk operating system
dpi	=	dots-per-inch
DSS-W	=	Defense Supply Service — Washington
EAC	=	Economic Adjustment Committee
EDS	=	Electronic Data Systems
EGA	=	enhanced graphics adapter

E-mail	=	electronic mail
FIPSPUB	=	Federal Information Processing Standard Publication
GB	=	gigabytes
GOSIP	=	Government Open Systems-Interconnection Profile
GSA	=	General Services Administration
GTE	=	General Telephone and Electric
GTSI	=	Government Technology Services, Inc.
HP	=	Hewlett-Packard
IEEE	=	Institute of Electrical and Electronic Engineers
IRM	=	information resource management
ISA	=	Integrated System Architecture
ISOLAN	=	International Standards Organization Local Area Network
IT	=	information technology
ITABBS	=	IT Acquisition BBS
LAN	=	local area network
LANMAN	=	Microsoft LAN Manager
MB	=	megabyte
MHz	=	megahertz
MS	=	Microsoft
MS-DOS	=	Microsoft-disk operating system
NIC	=	Network Interface Cards
NOS	=	network operating system
OASD(C ³ I)	=	Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence)
OEA	=	Office of Economic Adjustment

OUUSD(A&T)	=	Office of the Under Secretary of Defense for Acquisition and Technology
PC	=	personal computer
PCL	=	printer control language
PROMIS	=	project management information system
RAM	=	random access memory
7CG	=	7th Communications Group (Air Force)
SBA	=	standards-based architecture
SMC	=	Small Multiuser Computer
SMTP	=	simple mail transfer protocol
TCP/IP	=	Transmission Control Protocol/Internetworking Protocol
TP	=	twisted pair
UTP	=	unshielded twisted pair
VGA	=	video graphics adaptor
VS	=	virtual system
WFW	=	Windows for Workgroups
WHS	=	Washington Headquarters Services
WYSIWYG	=	what you see is what you get

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